PATENT SPECIFICATION

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372,210

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Complete Accepted: May 5, 1932.

COMPLETE SPECIFICATION.

Improvements relating to Closures for Jars, Bottles, Cans, and the like.

I, ADOLPH ALEXANDER THOMAS, a citizen of the United States of America, of 36, West 44th Street, City, County and State of New York, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to receptacles of the type having removable closures, its object being to provide a self-sealing cap or cover of novel construction and improved operation.

The invention consists in the combination of a jar, bottle, can, and the like, having a rimmed orifice and a removable cover incorporating an elastic diphragm capable of flexure about its periphery, said jar, bottle, can, and the like and cover being provided with cooperating means by which the diaphragm can be drawn into engagement with the rim and the relative dimensions of the rim and diaphragm being such that they engage one another at a material distance from the periphery of the diaphragm so as to ensure the flexure of the latter into sealing contact with the rim. By material distance is meant a distance necessary to ensure that when the diaphragm is drawn into engagement with the rim it will be placed under such tension as will ensure a sealing contact between those parts, and that distance can of course be varied within considerable limits according to the nature and dimensions of the materials employed and the tightness of closure required. The invention includes other features hereinafter described and claimed, and in order that it may be clearly understood reference will now be made to the accompanying drawings, in which:

Fig. 1 shows a preferred form of my self-sealing cap, this view being in diametric section;

Fig. 2 is a sectional view of a container provided with the cap of Fig. 1;

Fig. 3 is a fragmentary view showing the locking ribs on the container of Fig. 2;

Fig. 4 illustrates a one-piece cap embodying my invention, this view being partly sectioned for clearness; and

Fig. 5 shows the cap of Fig. 4 in sealing position on a container.

Referring to Figs. 1 and 2, the cap structure comprises a top member 10, a cylindrical shell or body portion 12, and an elastic flexible diaphragm or membrane 13. The top member 10 is formed with a cylindrical flange 14 and a peripheral recess 15. The shell 12 has a flange 16 adapted to fit over the flange 14 of top member 10, and the diaphragm 13 is rigidly clamped between flanges 14 and 16. In assembling the parts, the diaphragm 13 is placed over the flange 14 of member 10, and the part 12 is then driven home over the flange in a tight frictional fit. During this operation the peripheral portion 17 of the diaphragm is bent into the cylindrical space between flanges 14 and 16, which securely hold the diaphragm in tensioned condition. After the parts are thus assembled, the projecting portion 18 of the outer flange 16 is bent over into the peripheral recess 15 of top member 10. The dotted outline 18^1 in Fig. 1 indicates the initial position of the projecting portion 18 of flange 16.

The assembling of parts 10, 12 and 13 of the cap structure may be accomplished by machinery in a single operation. The shell 12 is preferably formed with a shoulder 19, which not only limits the relative inward movement of the shell and top member 10 during the assembling of the parts, but also cooperates with ring 15 to lock the parts against axial slipping. The top member 10 and shell 12 are preferably made of spun sheet metal like aluminium or an aluminium alloy, brass, steel, and others that may be found suitable. It is also possible to make the cap members 10 and 12 of molded material of the type represented by formaldehyde condensation products, of which the material known by the registered trade-mark "bakelite" is probably the most familiar. In that case, the parts 10 and 12 would be molded as a single member and the diaphragm 13 would be embedded at its periphery in the plastic material during the molding operation. This will

[Price 1/-]

be understood without additional illustration. The top member 10 projects the thin flexible diaphragm 13 against injury, and the intervening space 10^1 is sealed, so that no liquid can get into it.

The diaphragm 13 is an elastic membrane sufficiently thin to be flexible and placed under tension when the cap is mounted on a container, as I shall presently explain. The diaphragm 13 is preferably made of spring metal, like steel, brass, nickel, phosphor bronze, the material known by the registered trade-mark "duralumin", or other aluminium alloy, but it may also consist of non-metallic elastic material like "bakelite", celluloid, water-proof or metallized fabric, india rubber, and perhaps others. If the cap is used on receptacles containing liquid or food products, the outer surface of diaphragm 13 should be plated or otherwise covered with a suitable substance not affected by the contents of the receptacle. For example, if the diaphragm 13 is a disk of thin steel, it may be plated with chromium, which is unaffected by atmospheric conditions and does not contaminate foods and liquids. If the diaphragm 13 consists of a thin elastic sheet of "bakelite" or similar material, no special coating will usually be necessary. It will be understood that the foregoing enumeration of materials for diaphragm 13 is not intended as a restriction or limitation of my invention, but is merely for the purpose of illustration.

The container 20 in Fig. 2 terminates in an extension 21 of considerably smaller diameter than the body of the container. When the cap is placed in sealing position on the receptacle, the top rim 22 thereof engages the diaphragm 13 along a circular line 13^1 and the outer annular section 13*a* of the diaphragm is flexed or pulled down, whereby the central section of the diaphragm is stretched and forced into pressure engagement with the rim. This pressure engagement produces a sealed joint along the circular contact line 13^1. It is understood, of course, that the rim 22 is sufficiently smooth to make a fluid-tight joint with the tensioned diaphragm, which automatically accommodates itself to any minute irregularities in the top surface of the rim.

In the basic aspect of my invention, any practical means may be employed for removably locking the cap in sealing position on the container. In Figs. 1 and 2, the cylindrical shell of the cap is formed with inclined slots or grooves 23 adapted to receive the correspondingly arranged lugs or projections 24 on container 20. In other words, the cooperating parts 23 and 24 constitute screw-threads or bayonet joints for locking the cap on the container by a rotary movement. The projecting flange 16 of the cap may be roughened or knurled to afford a firm finger grip in turning the cap on and off. Instead of a screw connection between cap and container, I may use a hinged connection of any suitable type. It is immaterial how the cover is locked in sealing position on the receptacle, provided that the diaphragm 13 is automatically tensioned and flexed to produce a sealed joint. In some instances, an absolutely fluid-tight joint may not be required, and I therefore use the expression "sealed joint" in a practical rather than strictly technical sense.

In the modification of Figs. 4 and 5, the cap is made of a single piece of sheet material comprising a body portion or shell 25 and a diaphragm or membrane 26, which closes one end of the shell. The most practical way of making this one-piece cap is by spinning or otherwise shaping a sheet of elastic metal into the required form, but I may also mold the cap as a single piece of "bakelite", celluloid or similar material. The shell 25 is formed with screwthreads 27 adapted to engage the screwthreaded neck 28 of a suitable container 29, which is shown for illustration as a glass jar, such as would be used for preserving fruit and the like. The jar 29 terminates in an extension 30 of reduced diameter. When the cap is screwed home on the jar, the rim of extension 30 engages the diaphragm 26 along a circular line 26^1 and causes the diaphragm to be flexed downwardly at the annular section 26*a*. This flexing of the elastic diaphragm forces the same into firm pressure engagement with the top of the jar, so that a sealed joint is formed along the circular line 26^1. What has been said about the materials suitable for diaphragm 13 applies to diaphragm 26.

It will be observed that the elastic sealing diaphragm is normally flat (or substantially so) like a stretched membrane, and when the cap is loosened, the flexed diaphragm automatically springs back to normal position. In Figs. 1 and 2 the separate diaphragm 13 is automatically tensioned during the assembling of the parts, while in Figs. 4 and 5 the integral diaphragm 26 receives its normal tension in the spinning or shaping operation. If an underpressure develops in the container after the cap is in sealing position, the tendency of the stretched diaphragm will be to

curve inwardly, as indicated roughly at 26*b* in Fig. 5, and the effect of this inward buckling of the diaphragm is to increase the pressure along the contact edge 26[1]. The same applies to diaphragm 13 in Fig. 2. It is not necessary that the diaphragm shall actually buckle inwardly, for in some instances there may only be a tendency of the diaphragm to do so, but even such tendency would improve the sealing of the container. The one-piece cap of Figs. 4 and 5 can be made so cheap that it is particularly adapted for household fruit jars and for containers intended to be thrown away after the contents have been removed. Instead of making the diaphragms 13 and 26 of metal covered with a permanent plating that is not affected by the contents of the receptacles, the diaphragms can be left unplated and a lining of oiled or waxed paper (and the like) interposed between the diaphragm and the rim of the container. When I therefore speak of the diaphragm being in pressure contact with the rim of the receptacle. I do not necessarily mean a direct contact between the two, but I also include the possibility of an interposed lining.

It will be seen from the foregoing description that I have produced a self-sealing cap of unusually simple construction, which has no loose or replaceable parts and which can be made for any size, style or shape of container. For example, my new cap may be attached to cans or jars intended to hold tobacco, coffee, tea, sugar, flour, and other commodities used in the home. The cap is easy to keep clean, since there are no crevices where particles of food or liquid can lodge. The sealing diaphragm 13 or 26 may vary in size from an inch or so to several inches, and even more than one foot. In fact, the larger the diaphragm, the greater will be its flexibility to establish a fluid-tight joint. The thickness and degree of flexibility of the diaphragm will naturally vary with different materials and in different sizes of cap, and those factors can readily be determined by experiment for each particular design of cap. Also, the width of the flexed portion 13*a* and 26*a* of the diaphragm will largely depend upon the normal diameter and tension of the diaphragm. The sealing effect of the cap increases with use, because the rounded rim of the container tends to wear a groove along the contact line of the diaphragm, and this groove acts like a seat for the contacting surface of the container rim. I do not mean to suggest by the last statement that the diaphragm soon wears out, for it goes without saying that is is made of wear-resisting material that will last as long as the container itself.

Although I have shown and described certain specific constructions, my invention is not limited to the details set forth. Changes and modifications may be made without departing from the scope of the appended claims.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is :—

1. The combination of a jar, bottle, can, and the like, having a rimmed orifice and a removable cover incorporating an elastic diaphragm capable of flexure about its periphery, said container and cover being provided with cooperating means by which the diaphragm can be drawn into engagement with the rim and the relative dimensions of the rim and diaphragm being such that they engage one another at a material distance from the periphery of the diaphragm so as to ensure the flexure of the latter into sealing contact with the rim.

2. A combination according to claim 1 in which the cooperating means by which the diaphragm can be drawn into engagement with the rim are formed on inter-engaging cylindrical portions of the jar, bottle, can, and the like, and cover and the rim is formed on a cylindrical part of less diameter than that of the inter-engaging portions.

3. In or for a combination according to either preceding claim a cover comprising a body portion and a flexible diaphragm which is held substantially rigid at its periphery.

4. A cover according to claim 3 in which the body portion and diaphragm are integral.

5. A cover according to claim 3 in which the body portion includes a top from which the diaphragm is spaced.

6. A cover according to claim 3 in which the body portion includes a top and a shell between which parts the diaphragm is clamped.

7. A cover according to claim 6 in which the diaphragm is clamped between interfitting peripheral portions of the top and shell.

8. A cover constructed substantially as described with reference to Figs. 1—3 of the accompanying drawings.

9. A cover constructed substantially as described with reference to Figs. 4 and 5 of the accompanying drawings.

Dated this 11th day of September, 1931.

MARKS & CLERK.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1932.

[This Drawing is a reproduction of the Orgnal on a reduced scale.]

FIG. 1.

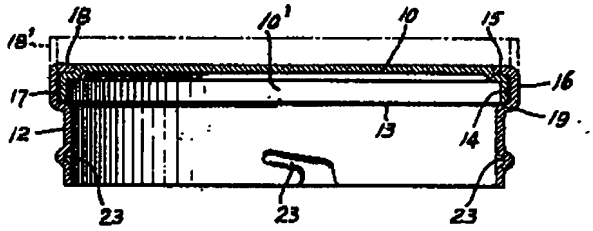
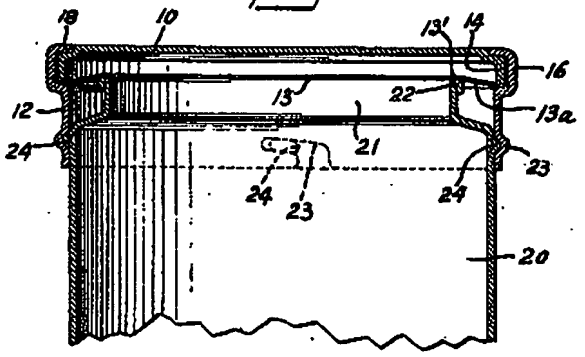


FIG. 2.



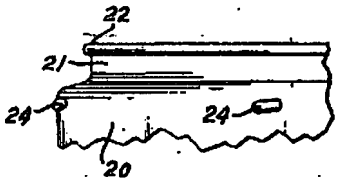


FIG. 3.

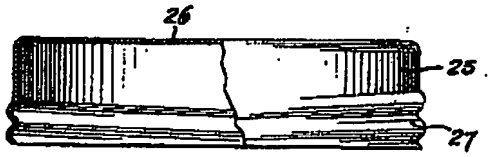
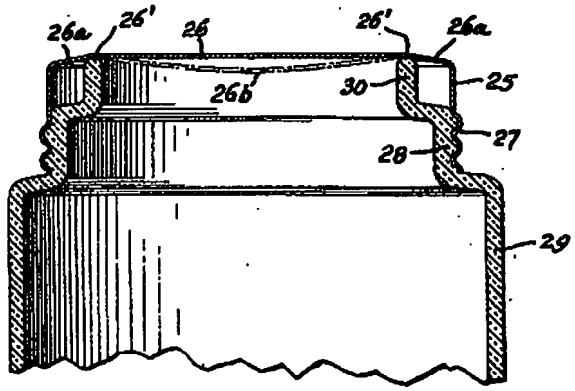


FIG. 4.

FIG. 5.



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